

CTK-4000/CTK-5000/LK-270/LK-205/WK-200/WK-500/CDP-200R MIDI Implementation

CASIO COMPUTER CO., LTD.

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Part I

MIDI Message Overview

1 Product Configuration as a MIDI Device

In terms of a MIDI device, this Instrument consists of a System Section, Performance Controller Section, and Sound Generator Section. Each of these sections can send and receive specific MIDI Messages in accordance with its function.

1.1 System Section

The System Section manages the Instrument status and user data. A communication method known as a "bulk dump" is supported, which allows two-way transfer of user data between the Instrument and a computer.

1.2 Performance Controller Section

The Performance Controller Section performs keyboard play and controller operations, and generates performance messages in accordance with auto play, etc. Basically, generated performance messages are sent to external destinations while also being transmitted to the Sound Generator Section. The channel number of the sent channel message is in accordance with Instrument's instrument part number.

MIDI Output Performance Information

The following describes the performance information that is output and is not output as MIDI signals.

- Output performance
 - Keyboard play by the performer
 - Auto accompaniment
 - Recorder playback
- Non-output performance
 - Demo performance
 - Song playback
 - Lesson function
 - Music Challenge

1.3 Sound Generator Section

The Sound Generator Section consists of a channel-independent common block and an independent instrument part specific to each channel. Mainly it receives performance information and sound source setting information.

1.3.1 Sound Generator Common Block

The common block consists of system effects, mixer master control, etc. These can be controlled by system exclusive messages that are basically exclusive to this particular instrument, but several parameters also can be controlled by general universal system exclusive messages.

1.3.2 Instrument Part Block

The instrument parts of the sound generator can be operated or their settings can be changed with Instrument-specific system exclusive messages and channel messages.

The 32 instrument parts of this Instrument are divided between Group A and Group B, each of which has 16 instrument parts. Only Group B can be controlled by external channel messages. As shown in the following table, there is a fixed relationship between channel message receive channel numbers and instrument parts.

| Number | Name | Channel | Assigned Function |
|--------|------|---------|--|
| 00 | A01 | 1 | Keyboard (Main) |
| 01 | A02 | 2 | Keyboard (Layered) |
| 02 | A03 | 3 | Keyboard (Split) |
| 03 | A04 | 4 | Keyboard/Recorder (Harmonize) |
| 04 | A05 | 5 | Sampling Phrase |
| 05 | A06 | 6 | Guide Sound |
| 06 | A07 | 7 | Guide Voice |
| 07 | A08 | 8 | Metronome |
| 08 | A09 | 9 | Auto Accompaniment (Percussion) |
| 09 | A10 | 10 | Auto Accompaniment (Drum) |
| 10 | A11 | 11 | Auto Accompaniment (Bass) |
| 11 | A12 | 12 | Auto Accompaniment (Chord 1) |
| 12 | A13 | 13 | Auto Accompaniment (Chord 2) |
| 13 | A14 | 14 | Auto Accompaniment (Chord 3) |
| 14 | A15 | 15 | Auto Accompaniment (Chord 4) |
| 15 | A16 | 16 | Auto Accompaniment (Chord 5) |
| 16 | B01 | 1 | MIDI/Auto Performance Functions/Recorder (Keyboard Playback Main) |
| 17 | B02 | 2 | MIDI/Auto Performance Functions/Recorder (Keyboard Playback Layered) |
| 18 | B03 | 3 | MIDI/Auto Performance Functions/Recorder (Keyboard Playback Split) |
| 19 | B04 | 4 | MIDI/Auto Performance Functions/Recorder (Solo 1) |
| 20 | B05 | 5 | MIDI/Auto Performance Functions/Recorder (Solo 2) |
| 21 | B06 | 6 | MIDI/Auto Performance Functions/Recorder (Solo 3) |
| 22 | B07 | 7 | MIDI/Auto Performance Functions/Recorder (Solo 4) |
| 23 | B08 | 8 | MIDI/Auto Performance Functions/Recorder (Solo 5) |
| 24 | B09 | 9 | MIDI/Auto Performance Functions |
| 25 | B10 | 10 | MIDI/Auto Performance Functions |
| 26 | B11 | 11 | MIDI/Auto Performance Functions |
| 27 | B12 | 12 | MIDI/Auto Performance Functions |
| 28 | B13 | 13 | MIDI/Auto Performance Functions |
| 29 | B14 | 14 | MIDI/Auto Performance Functions |
| 30 | B15 | 15 | MIDI/Auto Performance Functions |
| 31 | B16 | 16 | MIDI/Auto Performance Functions |

2 Timbre Type Specific Operation

The sound source operation performed for a received message depends on the current Timbre Type value (see "11.1 About the Timbre Type), which is the operation mode of each sound generator instrument part. For details, see the explanation for each message.

3 Conditions that Disable Message Send and Receive

All MIDI message send and receive is temporarily disabled while any one of the following processes is in progress.

- SD memory card operation in progress
Applicable Models: CTK-5000, LK-270, LK-205, WK-500, CDP-200R
- Recorder recording in progress
- Sampling operation in progress

Part II

Channel Message

4 Receive Channel

The channel number of the channel message received by each part is shown in the table under "1.3.2 Instrument Part Block".

5 Send Channel

Basically, the MIDI channel of the channel message sent when the Instrument is played coincides with the MIDI channel of the part being played. Note, however, that the MIDI channel of the performance information that corresponds to the keyboard main part is the Keyboard Channel setting value.

6 Note Off

Format

| | |
|-----------------|---|
| Message Format: | 8nH kkH vvH 9nH kkH 00H (receive only) |
| n: | MIDI Channel Number |
| kk: | Key Number |
| vv: | Velocity |
| | Send 40H |
| | Receive Ignored |

Send

Sent when something is played on the keyboard or when auto accompaniment is used. For keyboard play, the key number range is changed in accordance with the octave shift function.

Receive

Received by Instrument parts corresponding to MIDI. The velocity value is ignored. A part that is turned off by the Part Enable Parameter value explained under "24.3 Part Parameter" is not received.

7 Note On

Format

| | |
|-----------------|---------------------|
| Message Format: | 9nH kkH vvH |
| n: | MIDI Channel Number |
| kk: | Key Number |
| vv: | Velocity |

Send

Sent when something is played on the keyboard. The key number range is changed in accordance with the octave shift function.

Receive

Received by Instrument parts corresponding to MIDI. The velocity value is ignored. A part that is turned off by the Part Enable Parameter value explained under "24.3 Part Parameter" is not received.

8 Polyphonic Key Pressure

Format

| | |
|-----------------|---------------------|
| Message Format: | AnH kkH vvH |
| n: | MIDI Channel Number |
| kk: | Key Number |
| vv: | Pressure Value |

Send

This message is not sent by this Instrument.

Receive

This message is not received by this Instrument.

9 Control Change

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH ccH vvH |
| n: | MIDI Channel Number |
| cc: | Control Number |
| vv: | Value |

Send

Sent when the Instrument's pedal is operated or when Instrument settings are changed.

Receive

Receipt changes the pedal and other performance conditions, and Instrument settings.

9.1 Bank Select (00H,20H)

Format

| | |
|-----------------|--|
| Message Format: | BnH 00H mmH (MSB) BnH 20H 11H (LSB) |
| n: | MIDI Channel Number |
| mm: | MSB Value (Note1) |
| 11: | LSB Value |
| Send | 00H |
| Receive | Ignored |

Note 1:

For details about the relationship between the MSB value and the tone, see the Tone List that comes with the Instrument.

Send

Sent when a tone is selected. The LSB value is always 00H.

Receive

Receipt causes a change in the tone bank number stored in Instrument memory, but the tone is not actually changed until a Program Change message is received.

For details, see "11 Program Change". The LSB value is ignored.

9.2 Modulation (01H)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 01H vvH |
| n: | MIDI Channel Number |
| vv: | Value |

Send

This message is not sent by this Instrument.

Receive

Receipt adds, to the tone being sounded, modulation of a depth specified by the value. In the case of a tone that already has modulation applied, receipt of this message increases the modulation depth. The modulation effect differs according to the tone being used.

9.3 Data Entry (06H,26H)

Format

| | |
|-----------------|--|
| Message Format: | BnH 06H mmH (MSB) BnH 26H llH (LSB) |
| n: | MIDI Channel Number |
| mm: | MSB Value |
| ll: | LSB Value |

Send

Sent when there is a change to the parameter assigned to RPN. This Instrument does not have a parameter that corresponds to NRPN.

Receive

Receipt changes the parameter assigned to RPN. This Instrument does not have a parameter that corresponds to NRPN.

9.4 Volume (07H)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 07H vvH |
| n: | MIDI Channel Number |
| vv: | Value |

Send

Sent when auto accompaniment is used.

Receive

Receipt changes the volume of the corresponding part.

9.5 Pan (0AH)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 0AH vvH |
| n: | MIDI Channel Number |
| vv: | Value (Note1) |

Note 1:

For information about the relationship between setting values and send/receive values, see "33.3 Pan Setting Value Table" in "Part VII Setting Values and Send/Receive Values".

Send

Sent when auto accompaniment is used.

Receive

Receipt changes the pan setting of the corresponding part.

9.6 Expression (0BH)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 0BH vvH |
| n: | MIDI Channel Number |
| vv: | Value |

Send

Sent when auto accompaniment is used.

Receive

Receipt changes the Expression value.

9.7 Hold1 (40H)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 40H vvH |
| n: | MIDI Channel Number |
| vv: | Value (Note1) |

Note 1:

For information about the relationship between setting values and send/receive values, see the "33.1 Off/On Setting Value Table" in "Part VII Setting Values and Send/Receive Values" of this document.

Send

Sent when a pedal that has a sustain (damper) function is operated.

Receive

Receipt performs an operation equivalent to a sustain pedal operation.

Timbre Type Specific Operation

This operation differs in accordance with the Timbre Type (see "11.1 About the Timbre Type") setting.

- Timbre Type: Melody
Sustain off/on control is performed in accordance with the value of the received message.
- Timbre Type: Drum
The received message does not affect sound source operation.

9.8 Sostenuto (42H)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 42H vvH |
| n: | MIDI Channel Number |
| vv: | Value (Note1) |

Note 1:

For information about the relationship between setting values and send/receive values, see the "33.1 Off/On Setting Value Table" in "Part VII Setting Values and Send/Receive Values" of this document.

Send

Sent when a pedal that has a sostenuto function is operated.

Receive

Receipt performs an operation equivalent to a sostenuto pedal operation.

9.9 Soft (43H)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 43H vvH |
| n: | MIDI Channel Number |
| vv: | Value (Note1) |

Note 1:

For information about the relationship between setting values and send/receive values, see the "33.1 Off/On Setting Value Table" in "Part VII Setting Values and Send/Receive Values" of this document.

Send

Sent when a pedal that has a soft function is operated.

Receive

Receipt performs an operation equivalent to a soft pedal operation.

9.10 Reverb Send (5BH)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 5BH vvH |
| n: | MIDI Channel Number |
| vv: | Value |

Send

Sent when auto accompaniment is used.

Receive

Changes Reverb Send.

9.11 Chorus Send (5DH)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 5DH vvH |
| n: | MIDI Channel Number |
| vv: | Value (Note1) |

Note 1:

The setting value matches the value that is sent and received.

Send

Sent when auto accompaniment is used and when a Chorus on/off operation is performed.

Receive

Changes Chorus Send.

9.12 NRPN (62H,63H)

Format

| | |
|-----------------|--|
| Message Format: | BnH 62H 11H (LSB) BnH 63H mmH (MSB) |
| n: | MIDI Channel Number |
| 11: | LSB Value |
| mm: | MSB Value |

Send

This message is not sent by this Instrument.

Receive

This Instrument does not have a corresponding NRPN message.

9.13 RPN (64H,65H)

Format

| | |
|-----------------|--|
| Message Format: | BnH 64H 11H (LSB) BnH 65H mmH (MSB) |
| n: | MIDI Channel Number |
| 11: | LSB Value |
| mm: | MSB Value |

9.13.1 Pitch Bend Sensitivity

Format

| | |
|-----------------|--|
| Message Format: | BnH 64H 00H BnH 65H 00H BnH 06H mmH BnH 26H 11H |
| n: | MIDI Channel Number |
| mm: | MSB Value 0 - 12 |
| ll: | LSB Value |
| | Send 00H |
| | Receive Ignored |

Send

Sent when the Bend Range is changed on the CTK-5000, WK-500, or CDP-200R.

Receive

Receipt changes Bend Range.

9.13.2 Fine Tune

Format

| | |
|-----------------|--|
| Message Format: | BnH 64H 01H BnH 65H 00H BnH 06H mmH BnH 26H 11H |
| n: | MIDI Channel Number |
| mm: | MSB Value |
| ll: | LSB Value |

Send

This message is not sent by this Instrument.

Receive

Receipt changes Channel Fine Tune.

9.13.3 Coarse Tune

Format

| | |
|-----------------|--|
| Message Format: | BnH 64H 02H BnH 65H 00H BnH 06H mmH BnH 26H 11H |
| n: | MIDI Channel Number |
| mm: | MSB Value |
| ll: | LSB Value |

Send

This message is not sent by this Instrument.

Receive

Receipt changes Channel Coarse Tune. Does not affect sound source operation when the Timbre Type is Drum.

9.13.4 Null

Format

| | |
|-----------------|----------------------------|
| Message Format: | BnH 64H 7FH BnH 65H 7FH |
| n: | MIDI Channel Number |

Send

Sent after the Bend Range is changed on the CTK-5000, WK-500, or CDP-200R.

Receive

Receipt deselects RPN.

9.14 All Sound Off (78H)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 78H 00H |
| n: | MIDI Channel Number |

Send

Sent when Local is set to OFF on the Instrument.

Receive

Receipt stops all voices that are sounding.

9.15 Reset All Controllers (79H)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 79H 00H |
| n: | MIDI Channel Number |

Send

Sent when MIDI send related settings are changed on the Instrument.

Receive

Receipt initializes each performance controller.

10 Mode Message

10.1 All Notes Off (7BH)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 7BH 00H |
| n: | MIDI Channel Number |

Send

Sent when MIDI send related settings are changed on the Instrument, or when auto play is stopped, etc.

Receive

Receipt of any of this message releases the currently sounding voice (same as releasing the keyboard key).

10.2 Omni Off (7CH)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 7CH 00H |
| n: | MIDI Channel Number |

Send

This message is never sent.

Receive

Receipt of this message performs the same operation as when All Notes Off is received.

10.3 Omni On (7DH)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 7DH 00H |
| n: | MIDI Channel Number |

Send

This message is never sent.

Receive

Receipt of this message performs the same operation as when All Notes Off is received.

10.4 Mono (7EH)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 7EH 00H |
| n: | MIDI Channel Number |

Send

This message is never sent.

Receive

Receipt of this message performs the same operation as when All Notes Off is received.

10.5 Poly (7FH)

Format

| | |
|-----------------|---------------------|
| Message Format: | BnH 7FH 00H |
| n: | MIDI Channel Number |

Send

This message is never sent.

Receive

Receipt of this message performs the same operation as when All Notes Off is received.

11 Program Change

Format

| | |
|-----------------|------------------------|
| Message Format: | CnH ppH |
| n: | MIDI Channel Number |
| pp: | Program Number (Note1) |

Note 1:

For details about the relationship between the program number and the tone, see the Tone List that comes with the Instrument.

Send

Sent when a tone is selected.

Receive

Receipt of this message changes the tone of the part that corresponds to the MIDI channel.

The selected tone is determined by the program value of this message and the Bank Select message value received prior to this message.

Also note that receipt of this message also may change the Timbre Type that corresponds to the selected tone. For more information, see "11.1 About the Timbre Type" below.

11.1 About the Timbre Type

Tones that are selected by each Instrument part have an attribute that depends on the sound source operation type. This attribute is called the "timbre type," which is one of the types described below.

- Melody
This timbre type optimizes for normal melody tones.
- Drum
This setting optimizes for drum sounds. The damper pedal does not function. The Hold1, Channel Coarse Tune, and Master Coarse Tune messages are ignored if they are received.

12 Channel Aftertouch

Format

| | |
|-----------------|---------------------|
| Message Format: | DnH vvH |
| n: | MIDI Channel Number |
| vv: | Value |

Send

These messages are never sent.

Receive

Receipt of this message adds modulation to the voice that is sounding. The modulation effect differs according to the tone being used.

13 Pitch Bend

Format

| | |
|-----------------|---------------------|
| Message Format: | EnH llH mmH |
| n: | MIDI Channel Number |
| ll: | Value LSB |
| mm: | Value MSB |

Send

Sent when a pitch bender operation is performed on the CTK-5000, WK-500, or CDP-200R.

Receive

Receipt changes the pitch of the currently sounding note. The range of the pitch change depends on the Bend Range value setting.

Part III

System Messages

14 Timing Clock

Format

| | |
|-----------------|-----|
| Message Format: | F8H |
|-----------------|-----|

Send

Sent when auto accompaniment is used.

Receive

This message is not received by this Instrument.

15 Start

Format

| | |
|-----------------|-----|
| Message Format: | FAH |
|-----------------|-----|

Send

Sent when auto accompaniment is used.

Receive

This message is not received by this Instrument.

16 Stop

Format

| | |
|-----------------|-----|
| Message Format: | FCH |
|-----------------|-----|

Send

Sent when auto accompaniment is used.

Receive

This message is not received by this Instrument.

17 Active Sensing

Format

| | |
|-----------------|-----|
| Message Format: | FEH |
|-----------------|-----|

Send

This message is never sent.

Receive

Once this message is received, the Active Sensing mode is entered. If no MIDI message is received for a specified amount of time, voices being sounded by the Instrument's sound source are released, the controller is reset, and the Active Sensing mode is exited.

18 System Exclusive Message

Format

| | |
|-----------------|------------|
| Message Format: | F0H....F7H |
|-----------------|------------|

The Instrument sends and receives standard universal system exclusive messages, and system exclusive messages that have Instrument-specific formats.

18.1 Universal Realtime System Exclusive Message

Format

| | |
|-----------------|----------------|
| Message Format: | F0H 7FH....F7H |
|-----------------|----------------|

18.1.1 Master Volume

Format

| | |
|-----------------|---------------------------------|
| Message Format: | F0H 7FH 7FH 04H 01H 11H mmH F7H |
| 11: | LSB Value |
| mm: | MSB Value |

Send

This message is never sent.

Receive

Receipt changes the Master Volume parameter. Note that the Master Volume parameter cannot be changed with an Instrument operation.

18.1.2 Master Fine Tuning

Format

| | |
|-----------------|---------------------------------|
| Message Format: | F0H 7FH 7FH 04H 03H 11H mmH F7H |
| mm: | MSB Value (Note1) |

Note 1:

For information about the relationship between setting values and send/receive values, see "33.4 -100 - 0 - +99 Setting Value Table" in "Part VII Setting Values and Send/Receive Values" of this document.

Send

This message is sent when the tuning setting is changed.

Receive

Receipt changes the tuning setting.

18.1.3 Master Coarse Tuning

Format

| | |
|-----------------|---------------------------------|
| Message Format: | F0H 7FH 7FH 04H 04H 00H mmH F7H |
| ll: | LSB Value |
| mm: | MSB Value |

Send

Sent when Transpose is changed.

Receive

Receipt changes the Transpose parameter. Does not affect sound source operation when the Timbre Type is Drum.

18.1.4 Reverb Parameter

Format

| | |
|-----------------|--|
| Message Format: | F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 01H ppH vvH F7H |
| pp: | Parameter |
| vv: | Value |

Time Format

| | |
|-----------------|--|
| Message Format: | F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 01H 01H vvH F7H |
| vv: | Value (Note1) |

Note 1:

For information about the relationship between setting values and send/receive values, see "33.5 Reverb Time Setting Value Table" in "Part VII Setting Values and Send/Receive Values" of this document.

Send

Sent when the Reverb duration is changed.

Receive

Receipt changes the Reverb duration.

18.1.5 Chorus Parameter

Format

| | |
|-----------------|--|
| Message Format: | F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 02H ppH vvH F7H |
| pp: | Parameter |
| vv: | Value |

Type Format

| | |
|-----------------|--|
| Message Format: | F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 02H 00H vvH F7H |
| vv: | Value (Note1) |

Note 1:

For information about the relationship between setting values and send/receive values, see "33.6 Chorus Type Setting Value Table" in "Part VII Setting Values and Send/Receive Values".

Send

This message is sent when the System Chorus Type setting is changed.

Receive

Receipt changes the System Chorus Type parameter.

Rate Format

| | |
|-----------------|--|
| Message Format: | F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 02H 01H vvH F7H |
| vv: | Value (Note1) |

Note 1:

The setting value matches the value that is sent and received.

Send

This message is never sent.

Receive

Receipt changes the System Chorus Rate parameter.

18.1.6 GM System Message**GM System On Format**

| | |
|-----------------|-------------------------|
| Message Format: | F0H 7EH 7FH 09H 01H F7H |
|-----------------|-------------------------|

Send

This message is never sent.

Receive

Receipt puts the sound source into a GM sound source mode.

GM System Off Format

| | |
|-----------------|-------------------------|
| Message Format: | F0H 7EH 7FH 09H 02H F7H |
|-----------------|-------------------------|

Send

This message is never sent.

Receive

Receipt changes the sound source setting to the Instrument presetting.

GM2 System On Format

| | |
|-----------------|-------------------------|
| Message Format: | F0H 7EH 7FH 09H 03H F7H |
|-----------------|-------------------------|

Send

This message is never sent.

Receive

Though the Instrument does not support GM2, receipt of the GM2 System On message has the same result as receipt of the GM System On message.

18.1.7 GS Message

| | |
|-----------------|---|
| Message Format: | F0H 41H ddH 42H 12H 40H 00H 7FH 00H 41H F7H |
| Note: | dd (Device ID) is ignored. |

Send

This message is never sent.

Receive

Receipt performs the same operation as when the GM System On message is received.

18.2 Instrument-Specific System Exclusive Message

Format

| | |
|-----------------|------------------------|
| Message Format: | F0H 44H 16H 01H....F7H |
|-----------------|------------------------|

This message can be used to send the Instrument memory status, for two-way transfer of special operation commands and user data, to perform sound source parameter operations, etc.

For more information, see "Part IV Instrument-Specific System Exclusive Messages".

Part IV

Instrument-Specific System Exclusive Messages

19 Format

This section explains the format of the Instrument-specific System Exclusive Messages. See "Part V Parameter List" and "Part VI Parameter Set List" for information about how parameter sets actually are transferred.

19.1 Message Classifications

Basically, the operation that corresponds to Instrument-specific system exclusive messages is parameter data transfer. The following operations can be performed from an external device using this parameter transfer message.

- Modification of an individual Instrument parameter
- Batch modification of a particular Instrument parameter set
- Import of an individual Instrument parameter value
- Batch import of a particular Instrument parameter set

In addition to parameters being used as device setting values, some parameters act as commands when received by the Instrument and as device status information when sent from the Instrument. The following table shows the parameter category for each type of transfer.

| Function Section | Parameter Category | Description |
|------------------|--------------------|--|
| System | System | Commands to the Instrument, Instrument stats |
| | All | All user data |
| | Song | User Song |
| | Sequence | Recorder Song |
| | Lesson Rec | Recorder Song (Play-Along) |
| | Registration | Registration |
| | Scale Memory | User Scale Memory |
| | Rhythm | User Rhythm |
| Sound Generator | Patch | Sound source common settings (system effects, master settings, etc.) Instrument part settings (tone selection, mixer channel setting, tuning, etc.) |
| | Tone | Sampled sound (melody/drum) selected by the user |
| | Drum | Sampled sound (drum) referenced from "Tone" category parameters |
| | Instrument | Individual instrument setting referenced from "Drum" category parameters |
| | Wave Parameter | Sampled sound Wave setting |
| | Wave Data | Waveform actual data referenced from "Wave Parameter" category parameters |

19.2 Basic Message Structure

Instrument-specific system exclusive message operation can be broadly divided between two methods: Individual Parameter Transfer (single parameter send/receive) and Bulk Parameter Set Transfer (batch parameter send/receive). Each method includes a number of different messages. The field in the SysEx message that specifies the message type is the action (act) field. The format of the "body" part of the message depends on the "act" value.

The table below shows the body format for each action of Instrument-specific system exclusive messages. An actual message consists of the items indicated by "Y", from left to right.

| act | SX | MAN | MOD | dev | act | body (Depends on act) | | | | | | | | | | EOX | |
|-----|----|-----|-----|-----|-----|-----------------------|-----|------|-----|-----|-----|-----|-----|------|-----|-----|---|
| | | | | | | cat | mem | pset | blk | pkt | prm | idx | len | data | img | sum | |
| NOP | Y | Y | Y | Y | Y | - | - | - | - | - | - | - | - | - | - | - | Y |
| IPR | Y | Y | Y | Y | Y | Y | Y | Y | Y | - | Y | Y | Y | - | - | - | Y |
| IPS | Y | Y | Y | Y | Y | Y | Y | Y | Y | - | Y | Y | Y | - | - | - | Y |
| OBR | Y | Y | Y | Y | Y | Y | Y | Y | - | - | - | - | - | - | - | - | Y |
| OBS | Y | Y | Y | Y | Y | Y | Y | Y | - | Y | - | - | Y | - | Y | Y | Y |
| HBR | Y | Y | Y | Y | Y | Y | Y | Y | - | - | - | - | - | - | - | - | Y |
| HBS | Y | Y | Y | Y | Y | Y | Y | Y | - | Y | - | - | Y | - | Y | Y | Y |
| ACK | Y | Y | Y | Y | Y | Y | Y | Y | - | - | - | - | - | - | - | - | Y |
| BSY | Y | Y | Y | Y | Y | Y | Y | Y | - | - | - | - | - | - | - | - | Y |
| RJC | Y | Y | Y | Y | Y | Y | Y | Y | - | - | - | - | - | - | - | - | Y |
| EOD | Y | Y | Y | Y | Y | Y | Y | Y | - | - | - | - | - | - | - | - | Y |
| EOS | Y | Y | Y | Y | Y | Y | Y | Y | - | - | - | - | - | - | - | - | Y |
| ERR | Y | Y | Y | Y | Y | Y | Y | Y | - | - | - | - | - | - | - | - | Y |

19.3 Format of Each Field

19.3.1 SX : System Exclusive Message Status

Format: 11110000B

System Exclusive message Status = F0H

19.3.2 MAN : Manufacturer's ID

Format: 01000100B

Manufacturer's ID = 44H (CASIO)

19.3.3 MOD : Model ID

Format: 00010101B (MSB) 00000001B (LSB)

The Model ID of the series to which the Instrument belongs is shown by two consecutive bytes (MSB, LSB). (CTK-4000/CTK-5000/LK-270/LK-205/WK-200/WK-500/CDP-200R Model ID MSB = 16H, LSB = 01H)

19.3.4 *dev* : MIDI Device ID 00H-7FH

| | |
|---------|-----------|
| Format: | 0dddddddB |
|---------|-----------|

The contents of this field in a received message are compared with the Model's MIDI Device ID, and receipt of the incoming message is allowed only when the two IDs match. When a message containing 7FH is received, receipt of the message is always allowed, regardless of the Instrument's ID setting.

Note, however, that the Instrument does not have a specific Device ID, so use only 7FH for send and receive.

19.3.5 *act* : Action

| | |
|---------|------------|
| Format: | 0aaaaaaaaB |
|---------|------------|

aaaaaaaaB = Action

This field indicates the operation of the Instrument-specific System Exclusive Message.

| aaaaaaaaB | Action | Function |
|-----------|--------|--------------------------------------|
| 00H | NOP | No Operation |
| 01H | IPR | Individual Parameter Request |
| 02H | IPS | Individual Parameter Send |
| 03H | OBR | Oneway Bulk Parameter Set Request |
| 04H | OBS | Oneway Bulk Parameter Set Send |
| 05H | HBR | Handshake Bulk Parameter Set Request |
| 06H | HBS | Handshake Bulk Parameter Set Send |
| 0AH | ACK | Acknowledge |
| 0BH | BSY | Busy |
| 0CH | RJC | Reject |
| 0DH | EOD | End of Data |
| 0EH | EOS | End of Session |
| 0FH | ERR | Error |

NOP: No Operation

No operation is performed when this action is received.

IPR: Individual Parameter Request

Indicates an individual parameter value send request message. When the Instrument receives this action, it uses an IPS message to return the specified parameter value.

IPS: Individual Parameter Send

Indicates an individual parameter value send message. When the Instrument receives this action, it rewrites the value specified by the data field with the specified parameter value.

OBR: Oneway Bulk Parameter Set Request

Indicates a send request message using parameter set image one-way mode. When the Instrument receives this action, it uses an OBS message to return the specified parameter set.

OBS: Oneway Bulk Parameter Set Send

Indicates a parameter set image send message using one-way mode. The parameter set to be transferred is divided into multiple packets when it is greater than a prescribed size. At this time, packets are transferred at intervals of the prescribed time (20 msec) or greater.

HBR: Handshake Bulk Parameter Set Request

Indicates a send request message using the parameter set image handshake mode. When the Instrument receives this action, it uses an HBS message to return the specified parameter set.

HBS: Handshake Bulk Parameter Set Send

Indicates a parameter set image send message using handshake mode. The parameter set to be transferred is divided into multiple packets when it is greater than a prescribed size. The packets are transferred in accordance with handshake mode.

ACK: Acknowledge

Indicates a message used by the receiver during parameter set handshake mode transfer to convey to the sender that it is ready for send of the next packet. The cat, mem, and pset fields indicate the value carried by the last received message.

BSY: Busy

Indicates a message to convey to the requester that the Instrument cannot send back data after a parameter set one-way mode or handshake mode send request is received. The cat, mem, and pset fields indicate the value carried by the last received message.

RJC: Reject

Indicates a message to convey to the other side that an ongoing parameter set one-way mode or handshake mode send or receive session was interrupted. The cat, mem, and pset fields indicate the value carried by the last received message.

EOD: End of Data

Indicates a message to convey to the receiver that a one-way mode or handshake mode serial packet transfer for sending a sub-session (one parameter set) is complete. The cat, mem, and pset fields indicate the value carried by the last received message.

EOS: End of Session

Indicates a message to convey to the receiver that a one-way mode or handshake mode serial parameter set transfer session send, which was launched by some operation, is complete. The cat, mem, and pset fields indicate the value carried by the last received message.

ERR: Error

Indicates a message to convey to the sender that the checksum or message format of the previous packet was not correct when receiving a parameter set with handshake mode. The cat, mem, and pset fields indicate the value carried by the last received message.

19.3.6 *cat* : Category

Format: 0cccccccB

0cccccccB = Category (7bit)

The category indicates the categories of data handled by the System Exclusive Message. The ID number (ID) of the Category is indicated on the left, while the communication operation (Action) is indicated on the right.

| Category | | Transfer | | |
|----------|----------------|----------------------|--------------|----------------|
| ID (c) | Parameter Set | Individual Parameter | One Way Bulk | Handshake Bulk |
| 00H | System | A | - | - |
| 02H | Patch | A | - | - |
| 03H | Tone | A | A | A |
| 06H | Drum | A | A | A |
| 0DH | Instrument | A | A | A |
| 0EH | Wave Parameter | A | A | A |
| 0FH | Wave Data | F | A | A |
| 12H | Scale Memory | A | A | A |
| 1FH | All | F | A | A |
| 20H | Song | F | A | A |
| 21H | Sequence | F | A | A |
| 22H | Registration | F | A | A |
| 23H | Lesson Rec | F | A | A |
| 24H | Rhythm | F | A | A |

A.. Available (Also including when only some parameters are available.)

F... File Information (Not the data itself. Name, size, and other file information only.)

-... Not Available

19.3.7 *mem* : Memory Area ID

Format: 0mmmmmmmmB

Specifies the memory area that is the object of the parameter transfer. The following are defined for this Instrument.

| Mem | Type | Meaning |
|-----|-------------|---------------------|
| 0 | User area | Read/write enabled |
| 1 | Preset area | Read/write disabled |

19.3.8 *pset* : Parameter Set Number

Format: 0nnnnnnnB (LSB) 0mmmmmmmmB (MSB)

This field is a 2-byte (LSB, MSB) value indicating the number of the parameter set (mmmmmmmmnnnnnnnnB, Binary) being transferred.

19.3.9 *blk* : Block Number

The block number is a supplementary number that specifies which block parameter is to be accessed.

| | | | |
|---------|----------------|-----------|----------------|
| Format: | 0iiiiiiB (LSB) | 0jjjjjjjB | 0kkkkkkB (MSB) |
|---------|----------------|-----------|----------------|

Block Bit Field Division

When the parameter block has a multi-dimensional array structure, bit 21 of the block number is divided into prescribed bit fields based on the rules explained below.

- Case 1

When an array has three or fewer nesting levels and the number of arrays in each dimension is 128 or less, they are assigned below the three 7-bit fields. Unused regions are filled with zeros.

Example:

```
parameter [A] [B] [C]
```

With a 3-dimensional array parameter that consists of A=8 (3 bits), B=5 (3 bits) and C=10 (4 bits), the block bit fields are allocated as: Block = 0000aaa 000bbb ccccccc (Binary).

- Case 2

When Case 1 conditions are not satisfied, the minimal number of fields required for each number of arrays is reserved from the lower bit of the block. Unused regions are filled with zeros. (This case does not apply with this Instrument.)

Example 1:

```
parameter [A] [B] [C] [D]
```

With a 4-dimensional array parameter that consists of A=3 (2 bits), B=4 (2 bits), C=3 (2 bits) and D=4 (2 bits) like the one shown above, the block bit fields are allocated as: Block = 0000000 00000a abbccdd (Binary).

Example 2:

```
parameter [A] [B]
```

A=3 (2 bits), B=200 (8 bits)

With a 2-dimensional array parameter like the one shown above, the block bit fields are allocated as: Block = 0000000 000aab bbbbbbb (Binary).

19.3.10 *pkt* : Packet Number

| | | | |
|---------|----------------|-----------|----------------|
| Format: | 0iiiiiiB (LSB) | 0jjjjjjjB | 0kkkkkkB (MSB) |
|---------|----------------|-----------|----------------|

This is the divided packet number kkkkkkkjjjjjjjjiiiiiiB (Binary) for transferring a single parameter set.

19.3.11 *prm* : Parameter ID

| | | |
|---------|-----------------|-----------------|
| Format: | 0pppppppB (LSB) | 0qqqqqqqB (MSB) |
|---------|-----------------|-----------------|

The Parameter ID indicates the parameter type. When transferring parameters (see "Part V Parameter List" below) individually (as opposed to bulk transfer), this field is used to identify the parameter being transferred by its parameter ID.

19.3.12 *idx* : Data Index Number

| | | |
|---------|----------------|-----------------|
| Format: | 0iiiiiiB (LSB) | 0jjjjjjjB (MSB) |
|---------|----------------|-----------------|

The data index number indicates the first array number of the array from which transfer starts.

19.3.13 *len* : Data Length

| | | |
|---------|-----------------|------------------|
| Format: | 01111111B (LSB) | 0mmmmmmmmB (MSB) |
|---------|-----------------|------------------|

As shown below, the meaning of this field differs depending on whether an individual transfer or a bulk parameter set transfer is being performed.

Individual Parameter Transfer

Data length indicates the length of the array being transferred minus 1 when the parameter contains a character string or other similar array structure.

Bulk Parameter Set Transfer

Data length indicates the number of bytes of data included within a packet. When this value is zero, it means there is no actual data.

19.3.14 *data* : Parameter Data

| | | | | | |
|---------|-----------|-------------|-------------|-------------|-------------|
| Format: | 0dddddddB | (0eeeeeeeB) | (0fffffffB) | (0gggggggB) | (0hhhhhhhB) |
| | : | | | | |
| | : | | | | |

Parameter data indicates the parameter value. Data that is the size of the number of arrays equivalent to *len* + 1 follows. For the structure of one data item, the length depends on the data bit width, as shown below.

| dddddB + 1 | Number of Data |
|------------|----------------|
| 1 - 7 | 1 |
| 8 - 14 | 2 |
| 15 - 21 | 3 |
| 22 - 28 | 4 |
| 29 - 32 | 5 |

Each block of data is packed from the lowest order byte first. In the case of multiple-byte data, the lowest weighted bit is the LSB of the first "data" block, and the highest weighted bit is the MSB of the final "data" block. The following shows an example of how data would be divided for transfer in the case of 32-bit data.

| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------|---|---------|---------|---------|---------|---------|---------|---------|
| data0: | 0 | [bit06] | [bit05] | [bit04] | [bit03] | [bit02] | [bit01] | [bit00] |
| data1: | 0 | [bit13] | [bit12] | [bit11] | [bit10] | [bit09] | [bit08] | [bit07] |
| data2: | 0 | [bit20] | [bit19] | [bit18] | [bit17] | [bit16] | [bit15] | [bit14] |
| data3: | 0 | [bit27] | [bit26] | [bit25] | [bit24] | [bit23] | [bit22] | [bit21] |
| data4: | 0 | 0 | 0 | 0 | [bit31] | [bit30] | [bit29] | [bit28] |

19.3.15 Single Parameter Data Size Limit

With the Instrument's system exclusive message format, the size of a single message cannot exceed 256 bytes. The data size and the array size, however, can cause a packet to exceed 256 bytes when transferring a single parameter array. In this case, the IPS and IPR message data length and data index number values can be modified to enable division of a single parameter value into multiple messages so it can be sent that way.

19.3.16 *img* : Parameter Set Image

| | | | |
|---------|-----------|-----------|-----------|
| Format: | 0dddddddB | 0cccccccB | 000000abB |
|---------|-----------|-----------|-----------|

For a bulk data transfer operation, the parameter set data to be transferred is read sequentially in 16-bit units starting from the top address. Read values are divided into 3-byte segments as shown below, and then sent in sequence.

The following is the conversion format, which is the same as the individual parameter 16-bit transfer detailed above.

16-bit Memory Image

MSB: abccccccB

LSB: cdddddddB

↓

data0: 0dddddddB

data1: 0cccccccB

data2: 000000abB

If the length of the data being transferred is an odd number of bytes, the final bit field is filled in with zero.

Parameter Set Packet Division

The maximum image size of the parameter set that can be sent with one packet is 128 bytes. When data that exceeds 128 bytes is transferred, data is always divided into 128-byte units, except for the final packet. Because of this, the data in received packets can be stored in an areas the size of [Parameter Set Start Address] + [Packet Number] × 128.

For bulk parameter set transfer, the 16-bit image is divided in 3-byte groups, so the *img* field length is the value produced by multiplying the *len* value (*len* + 1 when *len* is an odd number) by 3/2. Note, however, that a parameter set of 128 bytes or less can be sent using a single packet, and anything greater than 128 bytes is divided among multiple packets. This means that the maximum length "data" field is $128 \times 3/2 = 192$ bytes.

Only one parameter set can be transferred per session, and data from different parameter sets cannot be mixed within a single packet, even when sending multiple parameter sets. Different parameter sets are always divided into separate packets.

19.3.17 *sum* : Check Sum

| | |
|---------|-----------|
| Format: | 0sssssssB |
|---------|-----------|

In this case, this "*sum*" field contains a value, which, when added to the total value of the "*img*" field, makes the lower seven bits 0.

The receiving side checks if this is true, and performs error handling (re-request, etc.) if it is not.

19.3.18 *EOX* : End of System Exclusive Message

| | |
|---------|-----------|
| Format: | 11110111B |
|---------|-----------|

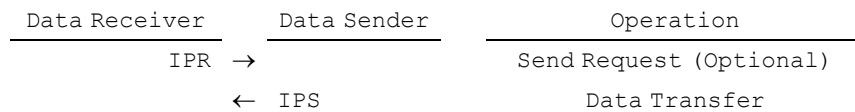
(End of System Exclusive message Status = F7H)

20 Individual Parameter Operations

There are two parameter unit operations: Individual Parameter Transfer and Individual Parameter Request.

For one session, in response to an IPR (Individual Parameter Request) from an external device, this Instrument returns an IPS (Individual Parameter Send) or the session is concluded when the external device or this Instrument spontaneously sends an IPS. If this Instrument received an IPS, the value of the applicable parameter is changed.

Depending on the function of a parameter, Individual Parameter Send may be used to issue a command to the Instrument and Individual Parameter Request may be used to check Instrument status information.



21 Parameter Set Transfer

21.1 Communication Modes

21.1.1 One-way and Handshake

In order to ensure maximum speed for bulk dumping of Parameter Sets, the data format is different from the data format used for Individual Parameter Send. Data is transferred as-is, using the Model's memory image.

Parameter Sets can be transferred by bulk dump using the message exchange types described below.

- One-way mode Parameter Set send/receive
- One-way mode Parameter Set send request send/receive
- Handshake mode Parameter Set send/receive
- Handshake mode Parameter Set send request, receive rejected, error notification send/receive

With the one-way mode, the sending device sends data and ends the session without regard to the response of the receiving device. This mode is best for one-way transfers from a sequencer or similar device. With the handshake mode, the sending device sends the data and then waits for a response from the receiving device before advancing to the next session. This is a high-speed mode in which there is no time wasted waiting.

See "Part VI Parameter Set List" for details about Instrument parameter sets.

21.1.2 Session and Subsession

Subsession

"One subsession" refers to transfer of one parameter set. A subsession transfers one parameter set or a parameter set that has been divided into multiple packets for transfer, with EOD (End of Data) at the end to terminate the send.

Division of a parameter set into multiple packets is used when the size of the parameter set is greater than a prescribed size. The packet number in the packet index field indicates the sequential position of a packet relative to the other packets. A single packet cannot be used to transfer multiple small parameter sets. A parameter set delimiter always must be transferred as a packet delimiter.

Session

"One session" refers to a series of processes that occur for one user operation. One subsession or multiple subsessions make up a session. The sender sends EOS (End of Session) to end a session.

Regardless of whether there is a single parameter set or multiple parameter sets being transferred, a bulk dump always takes the form of a session, never a subsession only.

21.2 One-way Mode Communication Flow

A session starts with the receiving device sending a request using an OBR, or with the sending device sending OBS data. The session ends after transfer of all the data in the parameter set being transferred by the sending device is complete.

The transferred messages of a single parameter set cannot exceed 256 bytes. When 256 bytes are exceeded, data is divided into multiple packets of 256 bytes or less each and transferred at fixed intervals (20 msec).

A final EOD informs the receiving device when the session is ended.

| Data Receiver (External Device) | Data Sender (This Instrument) | Operation |
|------------------------------------|--------------------------------------|-------------------------|
| OBR → | | Send Request (Optional) |
| ← | OBS (20 msec or greater interval) | Data Transfer |
| ← | OBS (20 msec or greater interval) | Data Transfer |
| ← | OBS (20 msec or greater interval) | Data Transfer |
| : | | |
| : | | |
| ← | EOD | End of Data |
| : | | |
| Other subsessions | | |
| : | | |
| ← | EOS | End of Session |

21.3 Handshake Mode Communication Flow

A session starts with the receiving device sending a request using a HBR, or with the sending device sending HBS data. The sending device does not send the next packet until it receives an ACK from the receiving device. The maximum wait time of at least 2000 msec is reserved. Failure of a response to arrive within the wait time is treated as a timeout error, and data communication is terminated.

The receiving devices returns ERR (error) when there is mismatch in the received data checksum or when an incompatible data format is discovered. When the sending device receives ERR (error) from the receiving device, it resends the last data sent. If an error repeats a number of times (three times or more for this Instrument), either the sending device or the receiving device sends an RJC to terminate the session.

A session ends after the sending device transfers the volume of data determined by the number of parameter sets being transferred, and sends EOD and EOS in response to an ACK from the sending device.

| Data Receiver | | Data Sender | Operation |
|-------------------|---|-------------|-------------------------|
| HBR | → | | Send Request (Optional) |
| | ← | HBS | Data Send |
| ACK | → | | Acknowledge |
| | ← | HBS | Data Send |
| ACK | → | | Acknowledge |
| | : | | |
| ACK | → | | Acknowledge |
| | ← | EOD | End of Data |
| | : | | |
| Other subsessions | | | |
| | : | | |
| | ← | EOS | End of Session |

The packet with the same packet number is resent when a checksum mismatch or incompatible data format error is detected.

| Data Receiver | | Data Sender | Operation |
|-------------------|---|-------------|-------------------------|
| HBR | → | | Send Request (Optional) |
| | ← | HBS | Data Send |
| ACK | → | | Acknowledge |
| | ← | HBS | Data Send 1 |
| ERR | → | | Error |
| | ← | HBS | Data Send 2 (Retry 1) |
| ERR | → | | Error |
| | ← | HBS | Data Send 3 (Retry 2) |
| ACK | → | | Acknowledge |
| : | | | |
| ACK | → | | Acknowledge |
| : | | | |
| ACK | → | | Acknowledge |
| | ← | EOD | End of Data |
| : | | | |
| Other subsessions | | | |
| : | | | |
| | ← | EOS | End of Session |

Session terminates if ERR is detected a number of times.

| Data Receiver | | Data Sender | Operation |
|-------------------|---|-------------|-------------------------|
| HBR | → | | Send Request (Optional) |
| | ← | HBS | Data Send |
| ACK | → | | Acknowledge |
| | ← | HBS | Data Send |
| (Error generated) | | | |
| ERR | → | | Error |
| | ← | HBS | Data Send (Retry 1) |
| (Error generated) | | | |
| ERR | → | | Error |
| | ← | HBS | Data Send (Retry 2) |
| (Error generated) | | | |
| ERR | → | | Error |
| | ← | HBS | Data Send (Retry 3) |
| (Error generated) | | | |
| RJC | → | | Session stopped |

RJC is sent to terminate the session in case ACK cannot be recognized.

| Data Receiver | Data Sender | Operation |
|--------------------------------|-------------|-------------------------|
| HBR → | | Send Request (Optional) |
| ← HBS | | Data Send |
| : | | |
| (Fixed amount of time elapses) | | |
| RJC ← | | Timeout error |

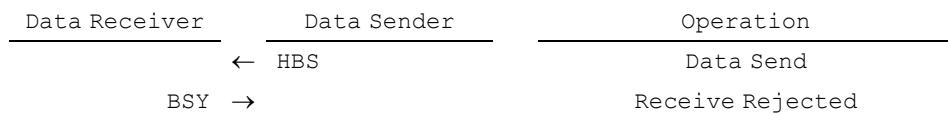
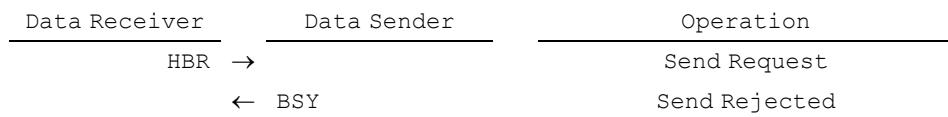
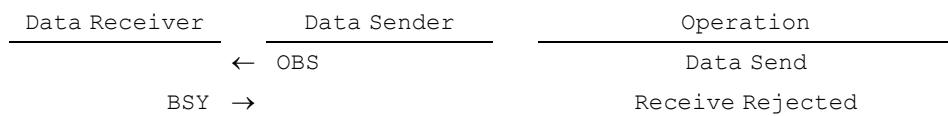
The session can be canceled for any reason by sending an RJC. RJC can be sent by the sending device or the receiving device. The bulk dump session is terminated immediately upon receipt of an RJC.

| Data Receiver | Data Sender | Operation |
|-----------------------|-------------|-------------------------|
| HBR → | | Send Request (Optional) |
| ← HBS | | Data Send |
| ACK → | | Acknowledge |
| ← HBS | | Data Send |
| : | | |
| : | | |
| (Terminate operation) | | |
| RJC → | | Data Receive Canceled |

| Data Receiver | Data Sender | Operation |
|-----------------------|-------------|-------------------------|
| HBR → | | Send Request (Optional) |
| ACK → | | Acknowledge |
| ← HBS | | Data Send |
| ACK → | | Acknowledge |
| ← HBS | | Data Send |
| : | | |
| : | | |
| (Terminate operation) | | |
| ← RJC | | Data Send Canceled |

BSY is returned to the external device when OBS, OBR, HBS, or HBR is sent while the Instrument mode is not suitable to perform bulk dump, etc. After BSY is received, the external device should wait until the Instrument enters a mode in which the session is enabled.

| Data Receiver | Data Sender | Operation |
|---------------|-------------|---------------|
| OBR → | | Send Request |
| ← BSY | | Send Rejected |



Part V

Parameter List

This section explains the parameters that actually can be transferred by the Instrument.

22 Using the Parameter List

- Parameter field
Shows the parameter name.
- ID field
Shows the parameter ID as a hexadecimal number.
- R/W field
Shows "R" to indicate that an IPR (Individual Parameter Request) read operation (Read) is possible or "W" to indicate that an IPS (Individual Parameter Send) write operation is possible.
- Block field
Shows the bit field allocation of the block number. The bit field position is shown as a decimal format number.
- Size field
Shows the parameter bit width as a decimal format value.
- Array field
Shows the parameter array size as a hexadecimal value.
- Min-Def-Max field
Shows the minimum value, default value, and maximum value for parameter acquisition as a hexadecimal value.
- Description field
Explains the meaning of parameter values. Unless otherwise specified, setting values are all indicated in decimal format.

23 System Parameters

These parameters make it possible for an external device to check the status of the Instrument and for an external device to command some operation of the Instrument.

23.1 System Information Parameter

This parameter is a container for system information.

| Parameter | ID | R/W | Block | Size | Array | Min-Def-Max | Description |
|------------------|------|-----|--------|------|-------|-------------|--|
| Model Name | 0000 | R | 000000 | 7 | 08 | 00-20-7F | Ascii Character CTK-4000 ... "CTK-4000" CTK-5000 ... "CTK-5000" LK-270 "LK-270 " LK-205 "LK-205 " WK-200 "WK-200 " WK-500 "WK-500 " CDP-200R ... "CDP-200R" |
| Program Revision | 0001 | R | ↑ | 7 | 08 | 00-20-7F | Ascii Character Ex. " 12345" |
| General Register | 0002 | R/W | ↑ | 8 | 01 | 00-00-FF | General-purpose register for communication test |

23.2 Data Management Parameter

These are information acquisition and operation command parameters for this Instrument's Data Manager PC application.

| Parameter | ID | R/W | Block | Size | Array | Min-Def-Max | Description |
|----------------------|------|-----|--------|------|-------|------------------------------|--|
| Ps Category | 0005 | W | 000000 | 7 | 01 | 00-00-7F | Specifies the category ID of the parameter set that corresponds to an operation. |
| Ps Memory | 0006 | W | ↑ | 7 | 01 | 00-00-7F | Specifies the memory ID of the parameter set that corresponds to an operation. |
| Ps Number | 0007 | W | ↑ | 14 | 01 | 0000-0001-3FFF | Specifies the number of the parameter set that corresponds to an operation. |
| Ps Data Type | 0008 | R | ↑ | 8 | 01 | 00-00-FF | This is the data type of the parameter set in the specified category. Compatibility is provided between models with the same type. |
| Current Ps Existence | 0009 | R | ↑ | 1 | 01 | 00-00-01 | Whether a parameter set exists in the specified category (0: No, 1: Yes). |
| Current Ps Protect | 000A | R | ↑ | 1 | 01 | 00-00-01 | Protect status of a parameter set data in the specified category (0: Off, 1: On). |
| Current Ps Size | 000B | R | ↑ | 32 | 01 | 00000000-00000000-FFFFFFFFFF | Size of a parameter set in the specified category/number (bytes). |
| Current Sub Ps Size | 000C | R | ↑ | 32 | 01 | 00000000-00000000-FFFFFFFFFF | Total size of a parameter sets under the specified category (bytes). |
| Current Ps Name | 000D | R | ↑ | 8 | 08 | 00-20-7F | Name of a parameter set in the specified category (ASCII characters). |
| Max Ps Size | 000E | R | ↑ | 32 | 01 | 00000000-00000000-FFFFFFFFFF | Maximum size of parameter sets in the specified category (bytes). |
| Max Ps Number | 000F | R | ↑ | 14 | 01 | 0000-0000-FFFF | Maximum number parameter sets in the specified category (bytes). |
| Current Free Size | 0010 | R | ↑ | 32 | 01 | 00000000-00000000-FFFFFFFFFF | Size of current parameter set free space in the specified category (bytes). |
| Max Free Size | 0011 | R | ↑ | 32 | 01 | 00000000-00000000-FFFFFFFFFF | Maximum size of parameter free space in the specified category (bytes). |
| Delete Ps | 0012 | W | ↑ | 1 | 01 | 00-00-01 | Deletes parameter sets in the specified category. Values are ignored. |

24 Patch Parameters

The main function of patch parameters is to configure the settings of the sound source of a device.

24.1 Master Tune Parameter

These parameters configure Master Tuning settings.

| Parameter | ID | R/W | Block | Size | Array | Min-Def-Max | Description |
|--------------------|------|-----|--------|------|-------|-------------|--------------------------|
| Master Fine Tune | 0000 | R/W | 000000 | 7 | 01 | 00-40-7F | -100 - 0 - +99 (cent) |
| Master Coarse Tune | 0001 | R/W | ↑ | 7 | 01 | 00-40-7F | -24 - 0 - +24 (semitone) |

24.2 Master Mixer Parameter

These parameters configure the Master settings of the mixer.

| Parameter | ID | R/W | Block | Size | Array | Min-Def-Max | Description |
|---------------|------|-----|--------|------|-------|-------------|-------------|
| Master Volume | 0002 | R/W | 000000 | 7 | 01 | 00-7F-7F | 0 - 127 |

24.3 Part Parameter

Part parameters configure the settings of each musical instrument part.

| Parameter | ID | R/W | Block | Size | Array | Min-Def-Max | Description |
|------------------|------|-----|------------------|------|-------|----------------|---------------------------|
| Part Enable | 0068 | R/W | 4-0: Part Number | 1 | 01 | 00-01-01 | 0...Off 1...On |
| Scalétune Enable | 0069 | R/W | ↑ | 1 | 01 | 00-01-01 | 0...Disable 1...Enable |
| Tone Num | 006A | R/W | ↑ | 14 | 01 | 0000-0000-3FFF | 0 - 16383 |
| Fine Tune | 006B | R/W | ↑ | 7 | 01 | 00-40-7F | -100 - 0 - +99 (cent) |
| Coarse Tune | 006C | R/W | ↑ | 7 | 01 | 28-40-58 | -24 - 0 - +24 (semitone) |
| Volume | 006D | R/W | ↑ | 7 | 01 | 00-64-7F | 0 - 127 |
| Acmp Volume | 006E | R/W | ↑ | 7 | 01 | 00-7F-7F | 0 - 127 |
| Pan | 006F | R/W | ↑ | 7 | 01 | 00-40-7F | -64 - 0 - +63 |
| Cho Send | 0070 | R/W | ↑ | 7 | 01 | 00-00-7F | 0 - 127 |
| Rev Send | 0071 | R/W | ↑ | 7 | 01 | 00-28-7F | 0 - 127 |
| Bend Range | 0072 | R/W | ↑ | 7 | 01 | 00-02-18 | 0 - 24 |

25 Scale Memory Parameter

Scale memory parameters store scale memory data.

| Parameter | ID | R/W | Block | Size | Array | Min-Def-Max | Description |
|------------|------|-----|--------|------|-------|-------------|--|
| Note | 0000 | R/W | 000000 | 8 | 0C | 00-80-FF | -128 - 0 - +127 Array : Note 0....C 1....C# 2....D 3....D# 4....E 5....F 6....F# 7....G 8....G# 9....A 10...A# 11...B |
| A Key Mode | 0001 | R/W | ↑ | 1 | 01 | 00-00-01 | 0....Relative 1....Absolute |

26 Song Parameter

The song parameter stores song data directory information.

| Parameter | ID | R/W | Block | Size | Array | Min-Def-Max | Description |
|-----------|------|-----|--------|------|-------|----------------------------|-----------------|
| Name | 0000 | R | 000000 | 7 | 08 | 20-20-7F | Ascii Character |
| Size | 0002 | R | ↑ | 32 | 01 | 00000000-00000000-00FFFFFF | 0 - 0xFFFFFFFF |

27 Rhythm Parameter

The rhythm parameter stores rhythm directory information.

| Parameter | ID | R/W | Block | Size | Array | Min-Def-Max | Description |
|-----------|------|-----|--------|------|-------|----------------------------|-----------------|
| Name | 0000 | R | 000000 | 7 | 08 | 20-20-7F | Ascii Character |
| Size | 0002 | R | ↑ | 32 | 01 | 00000000-00000000-00FFFFFF | 0 - 0xFFFFFFFF |

28 Sequence Parameter

The sequence parameter stores recorder song directory information.

| Parameter | ID | R/W | Block | Size | Array | Min-Def-Max | Description |
|-----------|------|-----|--------|------|-------|----------------------------|----------------|
| Size | 0001 | R | 000000 | 32 | 01 | 00000000-00000000-00FFFFFF | 0 - 0xFFFFFFFF |

29 Lesson Rec Parameter

The lesson rec parameter stores recorder song (play-along) directory information.

| Parameter | ID | R/W | Block | Size | Array | Min-Def-Max | Description |
|-----------|------|-----|--------|------|-------|----------------------------|----------------|
| Size | 0001 | R | 000000 | 32 | 01 | 00000000-00000000-00FFFFFF | 0 - 0xFFFFFFFF |

30 Registration Parameter

The registration parameter stores registration data directory information.

| Parameter | ID | R/W | Block | Size | Array | Min-Def-Max | Description |
|-----------|------|-----|--------|------|-------|----------------------------|----------------|
| Size | 0001 | R | 000000 | 32 | 01 | 00000000-00000000-00FFFFFF | 0 – 0xFFFFFFFF |

31 All Data Parameter

There is no parameter for storing all data directory information.

Part VI

Parameter Set List

This section explains actually how parameter sets can be transferred by the Instrument with bulk dump.

32 Parameter Set Table

| Parameter Set Category | <i>cat</i> | <i>mem</i> | <i>pset</i> |
|------------------------|------------|------------|--|
| Tone | 03H | 00H | 0000H - 0004H (Melody Sampling Tone 0 - 4) 0005H - 0007H (Drum Sampling Tone 0 - 2) |
| Drum | 06H | 00H | 0000H - 0002H (Drum Sampling Tone 0 - 2) |
| Inst | 0DH | 00H | 0000H - 07FH (Drum Sampling Tone 0 / Inst 0 - 127) 0080H - OFFH (Drum Sampling Tone 1 / Inst 0 - 127) 0100H - 17FH (Drum Sampling Tone 2 / Inst 0 - 127) |
| Wave Param | 0EH | 00H | 0000H - 0004H (Melody Sampling Tone 0 - 4) 0005H - 000CH (Drum Sampling Tone 0 / WaveParam 0 - 7) 000DH - 0014H (Drum Sampling Tone 1 / WaveParam 0 - 7) 0015H - 001CH (Drum Sampling Tone 2 / WaveParam 0 - 7) |
| Wave Data | 0FH | 00H | 0000H - 0004H (Melody Sampling Tone 0 - 4) 0005H - 000CH (Drum Sampling Tone 0 / WaveParam 0 - 7) 000DH - 0014H (Drum Sampling Tone 1 / WaveParam 0 - 7) 0015H - 001CH (Drum Sampling Tone 2 / WaveParam 0 - 7) |
| Scale Memory | 12H | 00H | 0003H - 0006H (User 1 - 4) |
| All | 1FH | 00H | 0000H - 003CH |
| Song | 20H | 00H | 0000H - 0009H (SongBank Song 0 - 9) |
| Sequence | 21H | 00H | 0000H - 0004H (Recorder Song 0 - 4) |
| Registration | 22H | 00H | 0000H - 0007H (Bank 0 - 8) |
| Lesson Rec | 23H | 00H | 0000H |
| Rhythm | 24H | 00H | 0000H - 0009H (User Rhythm 0 - 9) |

Field Contents

- *cat* field
Shows the category value.
- *mem* field
Shows the memory area ID value.
- *pset* field
Shows the parameter set number value.
Applicable parameter set numbers are those in the user area where the top number is zero, and are not the same numbers as those displayed by the Instrument.

Part VII

Setting Values and Send/Receive Values

33 Setting Value Tables

33.1 Off/On Setting Value Table

| Transmit Value | Receive Value | Parameter |
|----------------|---------------|-----------|
| 00H | 00H - 3FH | Off |
| 7FH | 40H - 7FH | On |

33.2 -64 - 0 - +63 Setting Value Table

| Transmit/Receive Value | Parameter |
|------------------------|-----------|
| 00H | -64 |
| 01H | -63 |
| : | : |
| 40H | 0 |
| : | : |
| 7EH | 62 |
| 7FH | 63 |

33.3 Pan Setting Value Table

| Transmit/Receive Value | Parameter |
|------------------------|-----------|
| 00H | Left |
| : | : |
| 40H | Center |
| : | : |
| 7FH | Right |

33.4 -100 - 0 - +99 Setting Value Table

| Transmit/Receive Value | Parameter |
|------------------------|-----------|
| (MSB-LSB) | |
| 00H-00H | -100 |
| : | : |
| 40H-00H | 0 |
| : | : |
| 7FH-7FH | 99 |

33.5 Reverb Time Setting Value Table

| Transmit/Receive Value | Parameter |
|------------------------|-----------|
| 00H | OFF |
| 0CH | 1 |
| 18H | 2 |
| 24H | 3 |
| 30H | 4 |
| 3CH | 5 |
| 48H | 6 |
| 54H | 7 |
| 60H | 8 |
| 6CH | 9 |
| 72H | 10 |

33.6 Chorus Type Setting Value Table

| Transmit/Receive Value | Parameter |
|------------------------|--------------|
| 00H | Chorus Type1 |
| 01H | Chorus Type2 |
| 02H | Chorus Type3 |
| 03H | Chorus Type4 |
| 04H | Chorus Type5 |

Part VIII

MIDI Implementation

Notation

34 Value Notation

34.1 Hexadecimal Notation

MIDI implementation sometimes requires that data be expressed in hexadecimal format. Hexadecimal values are indicated by the letter "H" after the value. The hexadecimal equivalents of decimal values 10 through 15 are expressed as the letters A through F. The table below shows the hexadecimal equivalents for decimal values 0 through 127, which are often used in MIDI messages.

| Decimal | Hexadecimal | Decimal | Hexadecimal | Decimal | Hexadecimal | Decimal | Hexadecimal |
|---------|-------------|---------|-------------|---------|-------------|---------|-------------|
| 0 | 00H | 32 | 20H | 64 | 40H | 96 | 60H |
| 1 | 01H | 33 | 21H | 65 | 41H | 97 | 61H |
| 2 | 02H | 34 | 22H | 66 | 42H | 98 | 62H |
| 3 | 03H | 35 | 23H | 67 | 43H | 99 | 63H |
| 4 | 04H | 36 | 24H | 68 | 44H | 100 | 64H |
| 5 | 05H | 37 | 25H | 69 | 45H | 101 | 65H |
| 6 | 06H | 38 | 26H | 70 | 46H | 102 | 66H |
| 7 | 07H | 39 | 27H | 71 | 47H | 103 | 67H |
| 8 | 08H | 40 | 28H | 72 | 48H | 104 | 68H |
| 9 | 09H | 41 | 29H | 73 | 49H | 105 | 69H |
| 10 | 0AH | 42 | 2AH | 74 | 4AH | 106 | 6AH |
| 11 | 0BH | 43 | 2BH | 75 | 4BH | 107 | 6BH |
| 12 | 0CH | 44 | 2CH | 76 | 4CH | 108 | 6CH |
| 13 | 0DH | 45 | 2DH | 77 | 4DH | 109 | 6DH |
| 14 | 0EH | 46 | 2EH | 78 | 4EH | 110 | 6EH |
| 15 | 0FH | 47 | 2FH | 79 | 4FH | 111 | 6FH |
| 16 | 10H | 48 | 30H | 80 | 50H | 112 | 70H |
| 17 | 11H | 49 | 31H | 81 | 51H | 113 | 71H |
| 18 | 12H | 50 | 32H | 82 | 52H | 114 | 72H |
| 19 | 13H | 51 | 33H | 83 | 53H | 115 | 73H |
| 20 | 14H | 52 | 34H | 84 | 54H | 116 | 74H |
| 21 | 15H | 53 | 35H | 85 | 55H | 117 | 75H |
| 22 | 16H | 54 | 36H | 86 | 56H | 118 | 76H |
| 23 | 17H | 55 | 37H | 87 | 57H | 119 | 77H |
| 24 | 18H | 56 | 38H | 88 | 58H | 120 | 78H |
| 25 | 19H | 57 | 39H | 89 | 59H | 121 | 79H |
| 26 | 1AH | 58 | 3AH | 90 | 5AH | 122 | 7AH |
| 27 | 1BH | 59 | 3BH | 91 | 5BH | 123 | 7BH |
| 28 | 1CH | 60 | 3CH | 92 | 5CH | 124 | 7CH |
| 29 | 1DH | 61 | 3DH | 93 | 5DH | 125 | 7DH |
| 30 | 1EH | 62 | 3EH | 94 | 5EH | 126 | 7EH |
| 31 | 1FH | 63 | 3FH | 95 | 5FH | 127 | 7FH |

34.2 Binary Notation

When a MIDI implementation data value is expressed in binary, the letter "B" (for "binary") is affixed at the end of the value. The table below shows the binary equivalents for the decimal values 0 through 127, which are often used for settings.

| Decimal | Hexadecimal | Binary |
|---------|-------------|-----------|
| 0 | 00H | 00000000B |
| 1 | 01H | 00000001B |
| 2 | 02H | 00000010B |
| 3 | 03H | 00000011B |
| 4 | 04H | 00000100B |
| 5 | 05H | 00000101B |
| 6 | 06H | 00000110B |
| 7 | 07H | 00000111B |
| 8 | 08H | 00001000B |
| 9 | 09H | 00001001B |
| 10 | 0AH | 00001010B |
| 11 | 0BH | 00001011B |
| 12 | 0CH | 00001100B |
| 13 | 0DH | 00001101B |
| 14 | 0EH | 00001110B |
| 15 | 0FH | 00001111B |
| 16 | 10H | 00010000B |
| : | : | |
| 125 | 7DH | 01111101B |
| 126 | 7EH | 01111110B |
| 127 | 7FH | 01111111B |

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